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AUTHOR Wildman, Terry M.; Burton, John K.
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ABSTRACT

This review of the state of educational evaluation, which is directed to both those who produce and those who consume evaluation data, suggests that certain prevalent evaluation practices are seriously out of step with, and inappropriate for, current mainstream instructional activity. Evaluation is recommended as not merely an appendage to instruction, but rather as essential for corrective feedback during the developmental stages of instruction. Further, evaluation is proposed as a process to deal singly and interactively with the various components of the system it serves. Some of the problems of changing the parameters of evaluation are described with emphasis on the need to evaluate the process of an educational program and not just the products. A common design framework is proposed for evaluators and instructional planners in theory based (e.g., behavioral, cognitive, humanistic) instructional evaluation. References and figures illustrating the model are attached. (MER)

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Matching Learning Theory. Instructional Technology, and Evaluation Design

(Paper presented at the 1980 AECT National Convention, Denver, Colorado, April 24, 1980)

Terry M. Wildman

and

John K. Burton

Virginia Polytechnic Institute and State University
Blacksburg, Virginia

For further information:

Terry M. Wildman
310 War Memorial Gym
College of Education
Virginia Polytechnic Institute
and State University
Blacksburg, VA 24061

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Matching Learning Theory, Instructional Technology, and Evaluation Design

This paper comments on the state of educational evaluation and is directed both to those who produce and to those who consume evaluation data. At a surface level educational evaluators (the producers) may reasonably begin the new decade with feelings of optimism and permanency because some form of evaluation is now required in almost every type of educational endeavor supported by public funds. In addition educational systems are under pressure to change. Issues such as "mainstreaming" multicultural education, increased community involvement in the educational process, and preparing children to meet mandated minimum competency standards are but a few of the challenges which policy makers face as the decade opens.

As the need for policy decisions continues to increase in number and urgency, so will the need for information on which to base those decisions. Moreover, policy makers often protect themselves through the redundency of several levels of evaluation. Evaluators can expect to be busy in the 80's.

This positive projection notwithstanding, evaluators and consumers should also be concerned about the directions each will take in the 80's. The first part of this paper suggests that certain prevelant evaluation practices are seriously out of step with, and inappropriate for, current mainstream instructional activity in this country. Moreover, since educational practice is not a static exercise, conceptual advances currently in the literature will continue to force changes in instructional practice and exacerbate further the existing asynchrony with evaluation practice. The sections which follow describe the problems, propose a solution framework, and

suggest an analysis of who should contribute what in future interactions between educators (teachers) and evaluators.

Signs and Dimensions of Asynchrony

Limited observations and limited variables

Evaluation of instruction has often been conducted as if it were possible to rush in, take a snap-shot of ongoing activity, and present this as evidence for making important decisions about a program. In this manner evaluation has "grown-up" more as an appendage to instruction than as an integral part of program development and operation. Even the more advanced two slice approach, featuring a pre-program slice and a postprogram slice, does not substantially improve this situation. One or two shot evaluations are problematic for several reasons. First, the approach fails to recognize that successful instruction is a continuous process and that many slices are necessary to be confident of its speed, direction and quality. Secondly, the slices are most often taken at the wrong time. During developmental stages instruction is "fluid" (Cronback, 1963) enough to benefit from corrective feedback whereas during full scale implementation it is highly unlikely that limited feedback will penetrate the more rigid structures. As appendages, evaluation components are very likely to be placed in these untimely positions. Finally, when one shot evaluations are planned it is necessary to select carefully the few variables to be observed or tested during a single visit, and this in turn creates two other major problems.

One outcome of the one shot evaluation approach is that it forces one to emphasize a very limited range of instructional variables (c.f. Scriven, 1972, 1975 & Stake 1976). Moreover, these variables are often examined in isolation with very little attention to interactions with each other, or with yet unnamed variables.

Figure 1 presents a model of current instructional design technology (Wildman, 1980) which makes explicit two important points: First, most instructional programs should be viewed as systems composed of many interacting components and second; evaluation as a process must deal singly and interactively with these various components. Note that evaluation is not simply a single component sandwiched between others all of which are arrayed in some linear fashion. Evaluation technology must be matched to the complexity of the system(s) it serves.

Is an evaluation theory or model enough?

When one examines the various components shown in Figure 1 it should be apparent that each represents a decision point in the design of instruction. It should also be apparent that decisions about learning outcomes, entry behaviors, sequencing, delivery systems, etc., can and do differ considerably across designers and also evaluators. One reasonable and systematic way in which designers and evaluators can reach different conclusions or decisions within components is to begin with competing views or theories of learning or for one or both parties to have no view at all. Selecting between inductive and deductive modes of learning, or between behavioral or information processing theories can for example, result in dramatically different kinds and sequences of instructional objectives, activities, and outcomes. When instructors and evaluators fail to agree upon a common learning framework for an evaluation study (or when an evaluator operates in a theoretical vacuum) it is possible for the two parties to view identical activities as having extraordinarily different values. The problem is that design and evaluation are areas which are appropriately technologies. As such they must be grounded in a common science; in common theory. When this does not occur it is analogous to solving a problem with newtonian physics and evaluating the solution with a relativistic orientation. The assumptions

that the problem solver and evaluator make are not the same. This problem is not solved by authors (e.g. House, 1976) who, in a thorough and scholarly manner, investigate the underlying philosophies of evaluation models. Properly evaluation relies on the decision points specified by the operative design model in terms of when to collect data and the common theory to decide what kind of data is needed. Thus, to look at the philosophical assumptions of evaluation models is to look at the wrong "layer" or level. It is inappropriate to design an evaluation system, or to analyze that system, without looking at the thoery beneath; the theory of learning. In this regard, Scriven's (1976) concern with bias has led him to suggest that the evaluator "blindly" search for as many outcomes as possible with little or no communication with project designers. Without careful handling this approach representing the most radical, and potentially dangerous break of technology from its scientific underpinnings.

Lack of theoretical orientations about the nature of the learning process can cause other problems for evaluators as well. Later we will see that the attainment of competence is currently viewed as a deceptively complex process during which students naturally assume a great deal of responsibility for, and control over, their own behaviors. Evaluators who do not understand these more recent views of learning are poorly equipped to attach values to current teacher and student behaviors.

Shifting emphasis

It follows from each point mentioned above that we need to reverse the long standing emphasis on products in educational evaluation at the expense of directly studying and rewarding process improvements. (e.g. Stake, 1976) The competency testing movement in this country represents a prime example of the greater interest in describing what students can and cannot do instead of focusing on what conditions led to their experiencing success or failure.

This and other such movements gives educators little information on which to build a better process. It tends to lump each program into a huge trial and error process such that successful elements are often lost in a global "error" judgement.

Stake (1976) and Guba (1978) have attempted to overcome this problem with a shift toward process observations. Interestingly neither focus on the learning theory of the designer to guide their observations.

A related problem is that to date the major emphasis in evaluation has been on what is wrong with an educational program or activity. While it is understandable that such information may be useful in making certain required administrative or policy decisions (e.g., to fire a teacher, exclude a program, establish funding priorities, etc.), it is equally clear that an emphasis on negative results contributes relatively little to a positive climate of growth within and among educators. Teachers and instructional designers do achieve successes, and attention to replications of successful applications over time are needed to maintain confidence in one's professional abilities, and to build a better technology of instructional practice.

Improving Evaluation Technology

We have taken the time to point out certain general problem with evaluation practices because they are worth solving. They are worth solving because evaluation will become one of the most critical activities performed by educators in the coming decade. This prediction is made not in the context of previous uses of evaluation data (e.g., making policy or funding decisions), but because evaluation, as shown in Figure 1, should become the focal point for ongoing instructional development and improvement. For this to occur however it is necessary for shift evaluation from its long standing position as an appendage to one where it serves a control function. This will require a developmental effort in itself.

Promoting a common design framework

Evaluators and instructional planners, whether the same person with two hats or two persons (or teams) with separate responsibilities, must understand that instruction and evaluation are inseparable functions. This concept is demonstrated graphically in Figure 2, the expanded version of Figure 1.

The rationale for systems approaches to design of instruction is well known (see, for example, Dick & Carey, 1978; Gagne & Briggs, 1974; Glaser, 1966, 1976; Merrill & Tennyson, 1977; Wildman, Burton & Niles, 1979) and need not be detailed again in this paper. Essentially, these models or design frameworks serve the several functions of detailing major decision components, suggesting an optimum flow of design tasks, and reminding designers of possible interactive effects among components. While it may be true that most public school personnel as individuals have little direct experience with true systems approaches, these practices are already extensively utilized in military and industrial applications and are increasingly attractive within the public sector.

What is most interesting about Figure 2 then, is the extent to which evaluation takes a major role in monitoring and guiding the entire process. Within this context those evaluation models which focus (for example) only on describing program objectives and subsequently testing to see whether the objectives have been mastered are clearly very limited in terms of contributing to overall program development. Others are similarly limited but in different respects. In each case however, the major challenge lies in diverting usable and timely information to the program developer. We should concede perhaps that other constituencies (e.g., taxpayers, non-academic administrators, parents, etc.) may be satisfied with the more superficial evaluations which yield only summary statements about program outcomes.

A closer examination of Figure 2 is needed however, to understand the needs of our primary audience: the developers and implementers. As shown here, each of the six major components in the design sequence has a logical impact on the construction of the most complete evaluation system. Notice also that evaluation has not been given a temporal place in the model. Rather, we are suggesting that evaluation serve on ongoing "memory" function by accumulating information as the decisions within each components are made and checked (and rechecked) against decisions in previous components. However, deciding the kind of information to collect and the use to which it is put requires yet another major reorientation for evaluators.

Promoting theory based instructional evaluation

In addition to design considerations, instructional development (and hence evaluation) is also theory related. Each of the major theoretical positions of learning (e.g., behavioral, cognitive, humanistic, etc.) interacts with the various components in Figure 2 to produce somewhat different decisions -- sometimes quite different decisions. Consequently, generating a match between instruction and evaluation requires simultaneous consideration of at least two major parameters -- design parameters and theory parameters. As represented in Figure 2, the particular data needs or requirements listed under each component are generated by considering general technical concerns as well as the various specific information needs associated with a given theoretical orientation. A more detailed examination of these components will demonstrate further the manner in which instructional and evaluation activities are synchronized.

This concern with matching instruction and evaluation activities begins with the needs assessment and task analysis components. One key notion here that is frequently lacking in current evaluation methodology is that

goals and objectives should not simply be accepted as presented, but should be examined in terms of the quality of the processes by which they were generated. The needs assessment process serves at least two critical functions. First, it ensures that program goals are continually updated and prioritized in terms of client needs. Secondly, these goal statements can be used as a standard for comparison to final program outcomes. The task analysis phase or component is more complex. The major purpose of this design component is to provide a detailed analysis of the information, attitudes, skills, and other requirements necessary to attain final learning outcomes. The technical details of performing task analyses are available elsewhere. The several implications for evaluation practice shown in Figure 2 however, should receive further mention. One of the basic objectives of task analysis is to make explicit the structure of to-be-learned content. Once this structure is known evaluators (and teachers) have several interesting options. First, objectives and accompanying evaluation items may be "copied" directly from the task structure. Secondly, if the task structure can display the information processing requirements it will greatly facilitate the development of devices for describing and assessing required student entry behaviors. Third, and most interesting, is the notion that task structures can be reproduced and used to graphically display student entry behavior and subsequent progress toward final learning outcomes. These graphic displays could show, over time, the cumulative development of student learning and could replace the standard lists of means, percentiles, and deviation scores which continue to confuse teachers and lie unused in school data systems. Presumably these displays could also be utilized in conjunction with the next component, analysis of student entry behaviors, to form an initial impression of the "distance" between students' existing cognitive structures (a critical

concept in cognitive orientations to learning) and the "expert" structures created via the task analysis phase. Repeated comparisons of this sort provide a visible and instructionally relevant tracking of student learning.

Keeping track of student entry capabilities is of course an ongoing task. Aside from the attempts to detect cognitive structure characteristics, it is also clear that a great variety of additional information is needed to serve other conceptual approaches to the training of human behavior such as described in the theories of Skinner, Piaget, Bruner, Gagne, Ausubel, and others. A full listing of relevant evaluation concerns would exceed by far those shown in Figure 2. Nevertheless, evaluators should have the capability to shift data collection strategies in conjunction with theoretical shifts.

The remaining three components deal explicitly with the various major decisions regarding instructional delivery. As we move into these areas evaluators will need to exhibit the following general capabilities:

1) The ability to assess the technical quality of decisions and subsequent activities within each of these design areas.

2) The ability to understand the relationship between learning theory and decisions made within and among these components.

3) The ability to understand that decisions vary with (in addition to conceptual notions about learning) the previous decisions made across the first three components.

One promising development in terms of understanding the more specific evaluation requirements across all these components is the emergence of several theory-based teaching models such as those described by Weil and Joyce (1978). Such models have served to make visible the fact that, for example, the Concept Attainment Model based on Bruner's work requires substantially different information requirements than does the Advance Organizer Model based on Ausubel's work. Here is a case where two models

from the same basic theoretical framework not only have different intended and incidental outcomes, but also require different kinds of student entry capabilities, are sequenced in opposite directions, involve different delivery systems and require substantially different learning activities. Even greater distinctions between data needs can be made when teaching models are generated from different theoretical frameworks. The challenge for evaluators, then, is to keep pace with these data demands which vary from model to model.

New Responsibilities

To remove these asynchronies which currently exist between teaching and evaluation activities both constituencies (i.e. teachers and evaluators) will have to engage in some rethinking concerning their responsibilities. Gains and losses will be experienced on both sides.

Teachers will gain in several important respects when ongoing and productive communication with evaluators is the rule. First, teachers should have a greater expectation that evaluators will play on their terms, that is, that they will generate evaluation questions and devices which will center around teachers' own theoretical and technical orientations. It should become a less frequent event that educators are unfairly subjected to the biases of evaluators who value only a limited range of instructional plans and activities simply because they do not correspond to historical patterns or do not produce outcomes amenable to standardized norm referenced testing procedures. Secondly, teachers should have increasing partnership in the conduct of evaluation studies which directly affect their professional lives.

These new partnerships however, carry with them some new responsibilities. Teachers will now be responsible for much of the documentation which goes into an evaluation study. Even in cases where independent evaluators are utilized, teachers may be required to submit information relative to the conceptual frameworks and/or models on which daily activities are based. Teachers will also need to provide details concerning program outcomes which may be different from those typically measured in large scale evaluations.

Evaluators will also experience certain benefits under more cooperative arrangements with instructional personnel. For one thing, they will have more information on which to generate evaluation plans and should also be able to expect a much higher level of documentation from teachers. Conducting an evaluation of instruction will become, as we have seen above, much more complex. Simple one and two slice evaluation models will have to be replaced by others more compatible with the newer instructional design and teaching models.

Administrators will benefit from having data to make decisions which is at once more fine grained and more related to the program designer's assumptions which were implicitly "bought" at the outset. This will also necessitate that administrators become more sophisticated consumers of theory. Finally educational researchers will benefit since evaluation would become research in a sense that the usual "traditional method" versus "whatever" never will.

The theory and technology is currently available to begin moving in these directions. What is needed now are school systems and professionals willing to begin moving toward these new relationships between evaluation and teaching.

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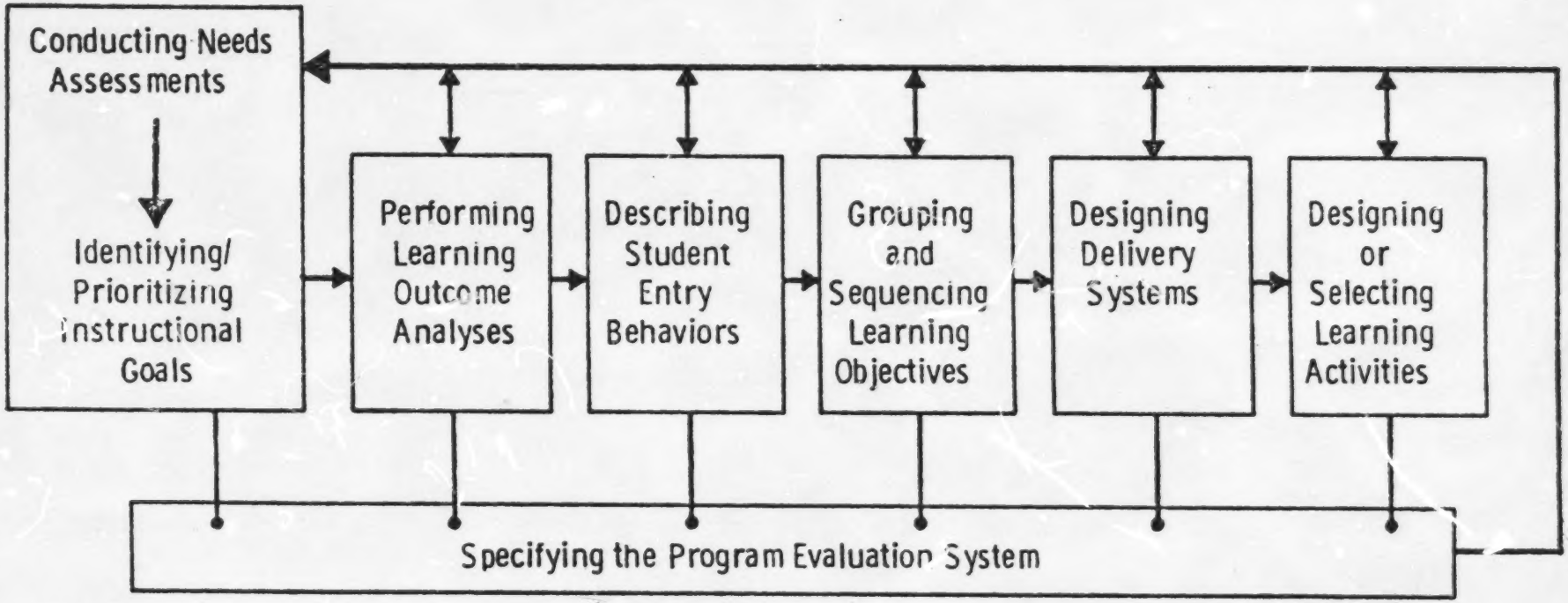
Conducting Needs Assessments
Identifying/ Prioritizing Instructional Goals
Performing Learning Outcome Analyses
Describing Student Entry Behaviors
Grouping and Sequencing Learning Objectives
Designing Delivery Systems
Designing or Selecting Learning Activities
Specifying the Program Evaluation System

Figure I. A Model for the Systematic Design of Instruction

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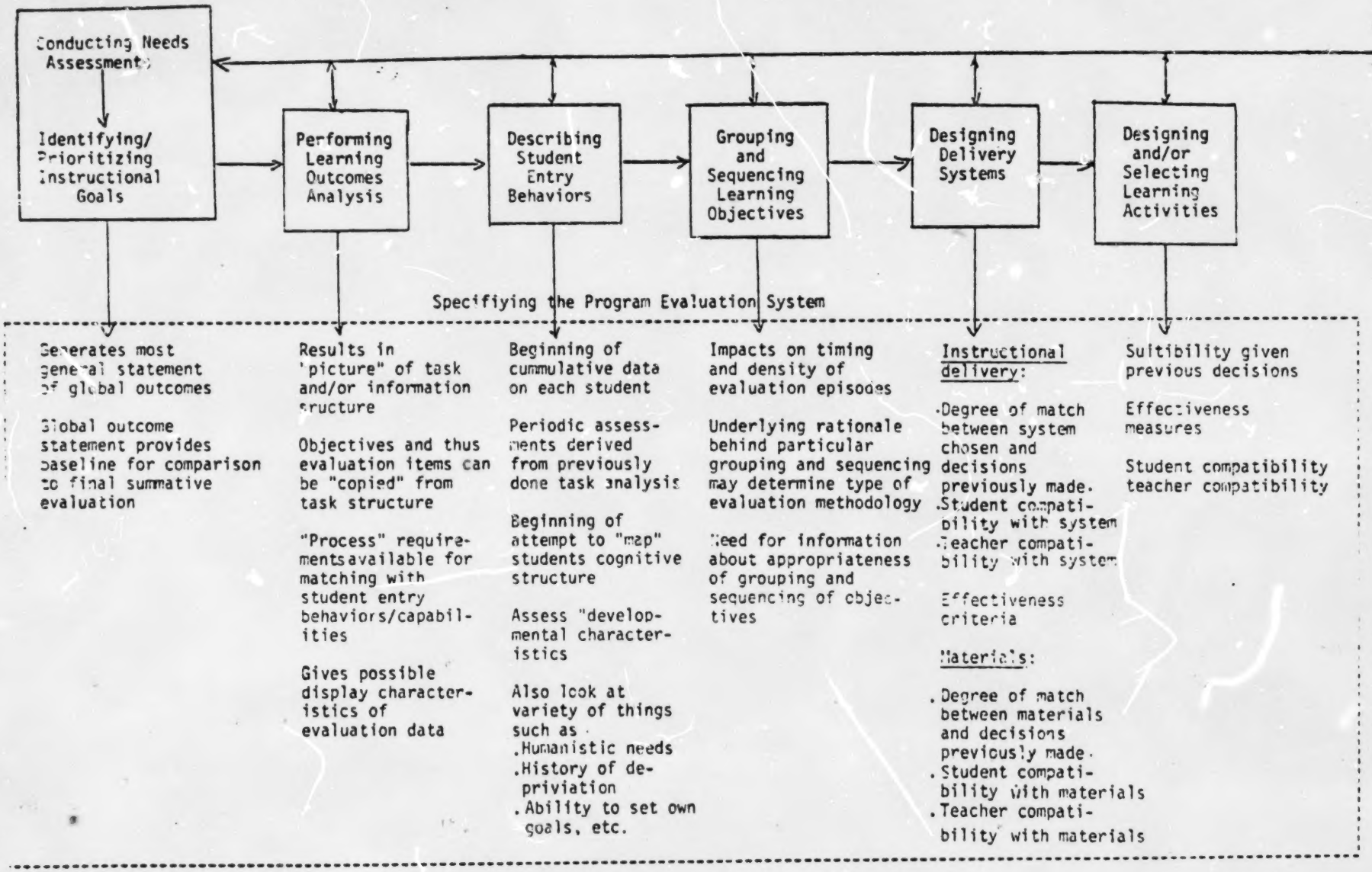
Conducting Needs Assessment
Identifying/ Prioritizing Instructional Goals
Performing Learning Outcomes Analysis
Describing Student Entry Behaviors
Grouping and Sequencing Learning Objectives
Designing Delivery Systems
Designing and/or Selecting Learning Activities
Specifiying the Program Evaluation System
Generates most general statement of global outcomes
Global outcome statement provides baseline for comparison to final summative evaluation
Results in "picture" of task and/or information structure
Objectives and thus evaluation items can be "copied" from task structure
"Process" requirements available for matching with student entry behaviors/capabilities
Gives possible display characteristics of evaluation data
Beginning of cummulative data on each student
Periodic assessments derived from previously done task analysis
Beginning of attempt to "map" students cognitive structure
Assess "developmental characteristics
Also look at variety of things such as
.Humanistic needs
.History of depriviation
. Ability to set own goals, etc.
Impacts on timing and density of evaluation episodes
Underlying rationale behind particular grouping and sequencing may determine type of evaluation methodology
Need for information about appropriateness of grouping and sequencing of objectives
Instructional delivery:
.Degree of match between system chosen and decisions previously made.
.Student compatibility with system
.Teacher compatibility with system
Effectiveness criteria
Materials:
. Degree of match between materials and decisions previously made.
. Student compatibility with materials
. Teacher compatibility with materials
Suitibility given previous decisions
Effectiveness measures
Student compatibility
teacher compatibility

Figure 2: A model specifying certain contributions of design components to program evaluation design.